IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Appellant:	Wayne A. Soehren	**Appeal Brief**
Serial No.	10/634,931	
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Group Art Unit	3736	
Examiner	Anuradha Roy	
Attorney Docket No.	H0002385-5601/400.412US01	
Title: HUMAN MOTION IDENTIFICATION AND MEASUREMENT SYSTEM AND METHOD		

On July 13, 2006, Appellants filed a notice of appeal from the final rejection of claims **1-19** set forth in the Office Action mailed March 7, 2006. This Appeal Brief is accompanied by a fee in the amount of $ 500.00 as required under 37 C.F.R. §1.17(c).

1. **Real party in interest**

The real party in interest in the above-captioned application is the assignee Honeywell International, Inc.

2. **Related appeals and interferences**

There are no other appeals or interferences known to the Appellants that will have a bearing on the Board's decision in the present appeal.

3. **Status of claims**

Claims **1-19** were rejected in an Office Action mailed March 7, 2006. The rejection of claims **1-19** is the subject of this appeal.

4. **Status of amendments**

An amendment was filed on May, 2006. The specification and not the claims were modified in that amendment. The Examiner did not indicate the amendments were entered.

5. **Summary of claimed subject matter**

Pursuant to 37 C.F.R. §41.37(c)(1)(v), Applicant provides the following concise explanation of the subject matter defined in each independent claim with reference to the specification by page and line number and to the drawings by reference number. Applicant submits that the citations to the specification and drawings are not intended to be exhaustive and that other support for the various claims may also be found throughout the specification and drawings.

A. Claim 1

Claim 1 is directed to a human motion classification and measurement system, comprising sensors for sensing a human, a motion classification unit connected to receive data from the sensors, an energy estimator unit connected to receive data from at least one of the motion classification unit and the sensors, and a Kalman filter connected to receive data from the motion classification unit and from the sensors. The Kalman filter has an output connected to the motion classification unit and the energy estimator unit so that the energy estimator unit is operable to identify an energy expenditure by the human.

The sensors for sensing a human are described at least in the specification from pages 8, line 14 to page 9, line 20. The sensors are represented by the numeral 14 as shown in Figure 1 and are represented by the numerals 20, 24, 30, and 34 as shown in Figure 2. The motion classification unit connected to receive data from the sensors is described at least in the specification at page 9 lines 16-20, page 10 lines 9-15 and is represented by the numeral 28 in Figure 2. The energy estimator unit is connected to receive data from at least one of the motion classification unit and the sensors. The energy estimator unit is described at least in the specification at page 10, lines 16-22 and is represented by the numeral 22 as shown in Figure 2. The Kalman filter, which has an

output connected to the motion classification unit and the energy estimator unit so that the energy estimator unit is operable to identify an energy expenditure by the human, is described at least in the specification at page 10, line 9-10 and lines 16-20 and is represented by the numeral 41 as shown in Figure 2. The Kalman filter outputs are indicated as an arrow with a KF resets label in Figure 2. The Kalman filter resets are shown as inputs to the motion classification unit, to the energy estimator and health monitor and to the inertial navigation unit, which are all connected to the Kalman filter.

B. Claim 2

Claim 2 is directed to a human motion classification and measurement system, comprising sensors for sensing a human, an energy estimator unit and a health monitor unit connected to receive data from the sensors and a Kalman filter connected to receive data from the sensors. The Kalman filter has an output connected to the energy estimator unit and the health monitor unit so that the energy estimator outputs an estimate of energy expended by the human and so that the health monitor outputs an indication of health of the human.

The sensors for sensing a human are described at least in the specification from pages 8, line 14 to page 9, line 20. The sensors are represented by the numeral 14 as shown in Figure 1 and are represented by the numerals 20, 24, 30, and 34 as shown in Figure 2. The energy estimator unit and health monitor unit that are connected to receive data from at least one of the sensors are described at least in the specification at page 10, lines 11-22 and are represented by the numerals 22 and 42, respectively, as shown in Figure 2. The Kalman filter is described at least in the specification at page 10, line 10-

12 and lines 16-20 and is represented by the numeral 41 as shown in Figure 2. The Kalman filter outputs are indicated by an arrow with a KF resets label in Figure 2. The Kalman filter has an output connected to the energy estimator unit and the health monitor unit so that the energy estimator unit is operable to identify an energy expenditure by the human and so that the health monitor outputs an indication of health of the human.

C. Claim 4

Claim 4 is directed to a human motion classification and measurement system, comprising a personal status sensor adapted for mounting on a human, motion sensors adapted for mounting on a human, a motion classification unit, and an output unit. The motion classification unit is connected to receive data from the motion sensors and to generate a motion type indicator signal from the received data. The output unit is connected to the personal status sensors. The output unit, which includes the energy estimator unit and the health monitor unit, receives the motion type indicator signal and provides an output indicating a status of human activity of the human.

The personal status sensor is described at least in the specification from page 9, lines 4-11 and is represented by the numeral 20 as shown in Figure 2. The motion sensors are described at least in the specification from page 8, lines 14-20, page 9, lines 12-4, and page 9, lines 16-20. The motion sensors are represented by the numeral 14 as shown in Figure 1 and are represented by the numerals 20, 24, 30, and 34 as shown in Figure 2. The motion classification unit connected to receive data from the sensors is described at least in the specification at page 9, lines 14-20 and is represented by the numeral 28 in Figure 2.

The output unit, including the energy estimator unit and the health monitor unit, provides an output indicating a status of human activity of the human as is described at least in the specification at page 9, lines 10-11 and page 10, lines 16-22 and page 11, lines 1-19. The output unit is represented by the numerals 22 and 42 in Figure 2. The output indicating a status of human activity of the human in represented by the numerals 44 and 46 in Figure 2.

D. Claim 10

Claim 10 is directed to a human motion classification and measurement system comprising personal status sensors, inertial sensors, an altimeter, a magnetic sensor, and a differential global positioning satellite sensor. The personal status sensors, the inertial sensors, the altimeter, the magnetic sensor, and the differential global positioning satellite sensor are all adapted for mounting to a human. The human motion classification and measurement system also includes a motion classification unit having inputs connected to the inertial sensors, the altimeter, and the magnetic sensors. The motion classification unit has outputs for data. The output data identify the motion type of the human and the distance traveled by the human.

The human motion classification and measurement system also comprises an energy estimator and health monitor unit. The energy estimator and health monitor unit have inputs connected to the personal status sensors. The energy estimator and health monitor unit also have inputs connected to motion classification unit to receive the motion type data. The energy estimator and health monitor unit output energy

expenditure information on the human motion and trigger an alarm upon traversal of a health threshold.

An inertial navigation unit is connected to receive data from the inertial sensors and outputs a navigation state. An input preprocessing unit has inputs connected to the global positioning satellite sensor, the magnetic sensor, the altimeter, and the motion classification unit. The input preprocessing unit has an output.

A filter is connected to receive data from the output of the input preprocessing unit. The filter has an output connected to the motion classification unit, the energy estimator and health monitor units, and the inertial navigation unit.

The personal status sensors are described at least in the specification at page 9, lines 4-11. The personal status sensors are represented by the numeral 20 as shown in Figure 2. The inertial sensors are described at least in the specification at page 9, lines 11-16. The inertial sensors are in the inertial measurement unit (IMU), which is represented by the numeral 24 as shown in Figure 2. The altimeter is described at least in the specification at page 9, lines 16-19. The altimeter is represented by the numeral 30 as shown in Figure 2. The magnetic sensor is described at least in the specification at page 9, lines 19-20. The magnetic sensor is represented by the numeral 34 as shown in Figure 2. The global positioning satellite sensor is described at least in the specification at page 10, lines 3-7. The global positioning satellite sensor is represented as DGPS with the numeral 40 as shown in Figure 2.

The motion classification unit connected to the inertial sensors and the altimeter and the magnetic sensors is described at least in the specification at page 9, lines 14-20

and page 10, lines 8-9. The motion classification unit is represented as the numeral 28 as shown in Figure 2. The motion classification unit outputs for data identifying motion type of the human is described at least in the specification at page 10, lines 10-12. The motion classification unit outputs for data identifying distance traveled by the human at least in the specification at page 10, lines 12-13.

The energy estimator and health monitor unit (including the inputs connected to motion classification unit to receive the motion type data and the output of energy expenditure information) are described at least in the specification at page 10, lines 11-13 and at page 10, line16 through page 11, line 12. The energy estimator and health monitor unit are represented by the numerals 22 and 42 as shown in Figure 2.

The inertial navigation unit that is connected to receive data from the inertial sensors and to output a navigation state is described at least in the specification at page 11, line 20 through page 12, line 1. The inertial navigation unit is represented as the numeral 26 as shown in Figure 2.

The input preprocessing unit, which has inputs connected to the global positioning satellite sensor, the magnetic sensor, the altimeter, and the motion classification unit, and which also has an output, is described at least in the specification at page 11, line 19 through page 12, line 11. The input preprocessing unit is represented as the numeral 32 as shown in Figure 2.

The filter, which is connected to receive data from the output of the input preprocessing unit and which is also connected to send data to the motion classification unit, the energy estimator and health monitor units, and the inertial navigation unit is

described at least in the specification at page 12, lines 14-22. The filter is represented as the numeral 41 as shown in Figure 2.

E. Claim 14

Claim 14 is directed to a human motion classification and measurement system that comprises personal status sensors, inertial sensors, an altimeter, a magnetic sensor, a differential global positioning satellite sensor, a motion classification unit, an energy estimator and a health monitor unit, an inertial navigation unit, an input preprocessing unit, a filter, and a measurement prefilter. The personal status sensors, the inertial sensors, the altimeter, the magnetic sensor, and the differential global positioning satellite sensor are all adapted for mounting to a human. The personal status sensor includes a respiration sensor, a heart rate sensor and a hydration sensor. The inertial sensors include three axis gyros and three axis accelerometers.

The motion classification unit has inputs connected to the inertial sensors, the altimeter, and the magnetic sensors. The motion classification unit has outputs for data identifying motion type of the human and distance traveled by the human.

The energy estimator and the health monitor unit have inputs connected to the personal status sensors and the output of the motion classification unit for motion type data. The energy estimator and the health monitor unit output energy expenditure information on the human motion and trigger an alarm upon traversal of a health threshold.

The inertial navigation unit is connected to receive data from the inertial sensors and outputs a navigation state output. The input preprocessing unit has inputs connected

to the global positioning satellite sensor, the magnetic sensor, the altimeter, and the motion classification unit. The input preprocessing unit also has an output.

The filter is connected to receive data from the output of the input preprocessing unit. The filter has an output connected to the motion classification unit, the energy estimator, health monitor units, and the inertial navigation unit. The measurement prefilter is connected between the input preprocessing unit and the filter. A human model is provided as input to the measurement prefilter. A human model, an initial input and a human input are provided as input to the measurement prefilter.

The personal status sensors are described at least in the specification at page 9, lines 4-11. The personal status sensors are represented by the numeral 20 as shown in Figure 2. The inertial sensors are described at least in the specification at page 9, lines 11-16. The inertial sensors are in the inertial measurement unit (IMU), which is represented by the numeral 24 as shown in Figure 2. The altimeter is described at least in the specification at page 9, lines 16-19. The altimeter is represented by the numeral 30 as shown in Figure 2. The magnetic sensor is described at least in the specification at page 9, lines 19-20. The magnetic sensor is represented by the numeral 34 as shown in Figure 2. The global positioning satellite sensor is described at least in the specification at page 10, lines 3-7. The global positioning satellite sensor is represented as DGPS with the numeral 40 as shown in Figure 2.

The motion classification unit connected to the inertial sensors and the altimeter and the magnetic sensors is described at least in the specification at page 9, lines 14-20 and page 10, lines 8-9. The motion classification unit is represented as the numeral 28 as

shown in Figure 2. The motion classification unit outputs for data identifying motion type of the human is described at least in the specification at page 10, lines 10-12. The motion classification unit outputs for data identifying distance traveled by the human at least in the specification at page 10, lines 12-13.

The energy estimator and health monitor unit (including the inputs connected to motion classification unit to receive the motion type data and the output of energy expenditure information) are described at least in the specification at page 10, lines 11-13 and at page 10, line16 through page 11, line 12. The energy estimator and health monitor unit are represented by the numerals 22 and 42 as shown in Figure 2.

The inertial navigation unit that is connected to receive data from the inertial sensors and to output a navigation state is described at least in the specification at page 11 line 20 through page 12, line 1. The inertial navigation unit is represented as the numeral 26 as shown in Figure 2.

The input preprocessing unit, which has inputs connected to the global positioning satellite sensor, the magnetic sensor, the altimeter, and the motion classification unit, and which also has an output, is described at least in the specification at page 11, line 19 through page 12, line 11. The input preprocessing unit is represented as the numeral 32 as shown in Figure 2.

The filter connected to receive data from the output of the input preprocessing unit and connected to send data to the motion classification unit, the energy estimator and health monitor units, and the inertial navigation unit is described at least in the

specification at page 12, lines 14-22. The filter is represented as the numeral 41 as shown in Figure 2.

The measurement prefilter is connected between the input preprocessing unit and the filter as described at least in the specification at page 12, lines 10-14. The pre-filter is represented as the numeral 50 as shown in Figure 2. The human model is input to the measurement prefilter as is described at least in the specification at page 12, lines 12-13. The input preprocessing unit inputs an initial input as is described at least in the specification at page 12 lines 4-11. The human input is provided to the input preprocessing unit as is described at least in the specification at page 12, line 5.

F. Claim 15

Claim 15 is directed to a method for monitoring human motion that includes sensing motion and metabolism rate of a human, classifying the motion of the human sensed in the sensing step and estimating energy expended by the human from the classified motion and from the metabolism rate.

The sensing motion and metabolism rate of a human is described at least in the specification at page 8, lines 8-11, and page 9, line 10. The classifying the motion of the human sensed in the sensing step is described at least in the specification at page 8, lines 11-13 and page 13, lines 1-3. The estimating energy expended by the human from the classified motion and from the metabolism rate is described at least in the specification at page 13, lines 3-9.

6. Grounds of rejection to be reviewed on appeal

A. Whether claims 4, 5, 6, 9, 15, 16, and 17 are anticipated under 35 U.S.C. §102(b) by Root et al. (US Patent No. 6,013,007)?

B. Whether claims 1, 2, 3, and 7 are obvious under 35 U.S.C. §103(a) by Root et al. in view of the Foxlin et al. (US patent 6,162,191)?

C. Whether claims 8, 10, 11, 12, 13, and 14 are obvious under 35 U.S.C. §103(a) by Root et al. in view of the Foxlin et al. and further in view of Vock et al. (US Patent No. 6,885,971)?

D. Whether claims 18 and 19 are anticipated under 35 U.S.C. §103(a) by Root et al. in view of the Teller et al. (US Publication No. 2002/0019586)?

7. Argument

A. Rejection of claims 4, 5, 6, 9, 15, 16, and 17 under 35 U.S.C. §102(b).

i. The Applicable Law

35 U.S.C. § 102 provides in relevant part:

A person shall be entitled to a patent unless-

(b) the invention was patented or described in a printed publication in this or a foreign country or in a public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

A claim is anticipated under 354 U.S.C. § 102 only if each and every element as set forth in the claim is found, either expressly or inherently, in a single prior art reference. *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 U.S.P.Q.2d 1051,1053 (Fed. Cir. 1987). "The identical invention must be shown in as

complete detail as is contained in the...claim." *Richardson v. Suzuki Motor Co.* 868 F.2d 1226, 1236, 9 U.S.P.Q.2d 1913, 1920 (Fed. Cir. 1989). The elements must be arranged as required by the claim, but identical terminology is not required. *In re Bond*, 910 F. 2d 831, 15 U.S.P.Q.2d 1566 (Fed. Cir. 1990).

Anticipation focuses on whether a claim reads on a product or process disclosed in a prior art reference, not on what the reference broadly teaches. *Kalman v. Kimberly-Clark Corp.*, 713 F.2d 760, 218 U.S.P.Q. 781 (Fed. Cir. 1983). To anticipate a claim, a reference must disclose every element of the challenged claim and enable one skilled in the art to make the anticipating subject matter. *PPG Industries, Inc. v. Guardian Industries Corp.*, 75 F.3d 1558, 37 U.S.P.Q. 2d 1618 (Fed Cir. 1996)

ii. Analysis

a. Claims 4, 5 and 6

Independent claim 4 recites "a motion classification unit connected to receive data from said motion sensors and generate therefrom a motion type indicator signal." This is described, for example, in the present application at least at page 8, lines 8 to 20. The Root patent does not disclose a motion classification unit that classifies motion based on motion sensors. The word classification is defined as "arranged in or assigned to classes." The classes of motion described in the present application include "standing (no motion), walking (slow motion), or running (fast motion)" (page 8, lines 10-11), as well as, "walking forward, walking backward, walking sideways, running forwards, running backwards, walking sideways, walking up and down a slope, walking up and down stairs, turning left and right, and running, etc." (page 8, lines 18-20).

Speed is not a motion classification. However, the Examiner indicates in the first paragraph on page 4 of the final office action of March 7, 2006 that "average speed" is a motion type. Speed is a continuous parameter, while the motion classifications defined in the present application are separate, non-contiguous categories of motion that lend themselves to classification. Each class of motion includes a range of speeds. The range of speeds for a class of motion can overlap with the range of speeds for another class of motion. For example, the speed of walking forward on a flat surface can be the same as the speed of walking up stairs, but the class of motion as defined in the present application is different.

The applicant asserts that the speed of a person does not indicate whether the person is engaging in any of the motion types shown in Figure 10 of the Root patent, i.e., running, bicycling, hiking/walking, skating, skiing, or other. Indeed, the Root patent recognizes that speed does not indicate motion type because, although the Root patent discloses determining speed, the user is still required to manually input exercise session type through a menu process. Specifically, the Root patent describes "main menus designated as 'exercise session type'..." (column 6, lines 43-44) and states that "before exercising, the athlete turns on the GPS-based personal performance monitor... and sets his/her preferences using menu control buttons..." (column 6, lines 63-66). The input of exercise session type by a user using menu control buttons is not a motion classification unit that classifies motion based on motion sensors.

In the first paragraph of the advisory action of June 19, 2006, the Examiner asserts that the Root patent anticipates a motion classification unit that

classifies motion based on motion sensors since the Root patent discloses "a smart algorithm based on measured parameters such as speed, pace, exercises type, heart rate and so forth can be optionally used to automatically determine if the athlete has temporarily suspended exercising and temporarily pauses monitoring until exercise is resumed." The applicant asserts that pace and heart rate, like speed, are continuous parameters (not separable categories) and do not classify motion. The pace of walking up a slope can be the same as the pace of walking down a slope. Exercise type does not indicate if the person is going forward, backward, sideways or turning on a slope or flat surface.

The applicant further asserts that in combination speed, pace, exercises type, and heart rate do not define categories for motion type. Speed, pace, exercises type, heart rate do not indicate if the person is going forward, backward, sideways or turning on a slope or flat surface.

Therefore, because the Root patent does not disclose "a motion classification unit connected to receive data from said motion sensors and generate therefrom a motion type indicator signal," the Root patent does not anticipate independent claim 4.

Because independent claim 4 is patentable over the Root patent, dependent claims 5 and 6 are likewise patentable over the Root patent.

b. Claim 9

Claim 9 depends from claim 4 and recites a filter that receives data from the motion classification unit and that provides an output to the motion classification unit and to the output unit.

On page 4 of the Office Action, the Examiner merely repeats the argument that column 7, lines 52-56 of the Root patent discloses the filter recited in dependent claim 9.

However, this portion of the Root patent merely states that a smart algorithm can filter out erroneous position points resulting from signal interference or from induced errors through the U.S. government's Selective Availability (SA) program, which intentionally limits the absolute accuracy of civilian GPS receivers.

Hence, there is no disclosure in this portion of the Root patent that this filtering is based on motion classification or that this filtering provides an output to both a motion classification unit and an output.

The Examiner asserts that the smart algorithm described in column 7, lines 52-56 of the Root patent receives data from the CPU and provides data back to the CPU. However, the Root patent discloses no such thing. Indeed, this smart algorithm could execute in the GPS receiver 604 and receive no input from the CPU.

Moreover, even if this smart algorithm resides in the CPU, the CPU of the Root patent is not a motion classification unit. At most, it is the user who is a "motion classification unit" because the user, not the CPU, classifies motion. Accordingly, even if the smart algorithm discussed in column 7, lines 52-56 is executed on the CPU, it does

not receive data from the motion classification unit and provide an output to the motion classification unit as required by dependent claim 9.

Furthermore, the filtering described in the Root patent is based on signal interference and errors purposely induced in the GPS system. Signal interference and errors purposely induced in the GPS system do not suggest filtering based on motion classification. Therefore, for the reasons described above with respect to claim 4 and claim 9, the Root patent does not anticipate dependent claim 9.

It is noted that, at the bottom of page 5 and carrying over to the top of page 6 of the Office Action, the Examiner asserts that the term "connected to," is a term of use and not limitation. However, this term characterizes the nature of other terms in the claim and, therefore, is a proper limitation. Thus, as claim 9 includes this language it is proper to consider the language following the term "connected to" in determining the patentability of claim 9.

c. Claims 15, 16 and 17

Independent claim 15 recites "sensing motion...of a human" and "classifying the motion of the human sensed in the sensing step." As discussed above, the Root patent does not disclose or suggest using sensed motion in order to classify human motion.

Accordingly, independent claim 15 is not anticipated by and would not have been obvious over the Root patent.

Moreover, independent claim 15 recites the sensing of metabolism rate of a human and estimating energy expended by the human from the classified motion and from the metabolism rate. The Root patent does not disclose or suggest sensing metabolism or using metabolism with motion class to estimate expended energy.

Therefore, because the Root patent does not disclose "sensing motion and metabolism rate of a human" and "classifying the motion of the human sensed in the sensing step," the Root patent does not anticipate independent claim 15 and independent claim 15 would not have been obvious over the Root patent.

Because independent claim 15 is patentable over the Root patent, dependent claims 16 and 17 are likewise patentable over the Root patent.

B. Rejection of claims 1, 2, 3, and 7 under 35 U.S.C. § 103(a)

i. The Applicable Law

35 U.S.C. § 103 provides in relevant part:

Conditions for patentability, non-obvious subject matter.

(a) A patent may not be obtained though the invention is not identicallay disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

"The ultimate determination...whether an invention is or not obvious is a legal conclusion based on underlying factual inquiries including (1) the scope and content of the prior art; (2) the level of ordinary skill in the prior art; (3) the differences between the

claimed invention and the prior art; and (4) the objective evidence of nonobviousness." *In re Dembiczak*, 175 F.3d 994, 998, 50 USPQ2d 1614, 1616 (1999) (citing *Graham v. John Deere Co.*, 383 U.S. 1, 17-18, 148 USPQ 459, 467 (1966)).

When applying 35 U.S.C. §103(a), the claimed invention must be considered as a whole; the references must be considered as a whole and must suggest the desirability and thus the obviousness of making the combination; the references must be viewed without the benefit of impermissible hindsight afforded by the claimed invention and a reasonable expectation of success is the standard with which obviousness is determined. *Hodosh v. Block Drug Co., Inc.*, 786 F.2d 1136, 1143 n.5, 229 USPQ 182, 187 n.5 (Fed. Cir. 1986).

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine teachings in the references. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. MPEP 2143.

The teaching or suggestions to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in the applicant's disclosure. MPEP 2143 citing *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

ii. Analysis

a. Claim 1

Claim 1 recites "a motion classification unit connected to receive data from said sensors," and "a Kalman filter connected to receive data from said motion classification unit and from said sensors, said Kalman filter having an output connected

to said motion classification unit and said energy estimator unit so that said energy estimator unit is operable to identify an energy expenditure by the human."

As discussed above, the Root patent does not disclose or suggest motion classification based on information from sensors.

Similarly, the Foxlin patent does not disclose or suggest motion classification based on information from sensors.

Instead, the Foxlin patent discloses a sensor apparatus that senses yaw, pitch, and/or roll of a human body, particularly the head. The sensor apparatus can be used in virtual reality machines to track motion of a user's head. For such an application, the Foxlin patent does not suggest motion classification.

Accordingly, because neither the Root patent nor the Foxlin patent suggests sensor based motion classification to one of ordinary skill in the art, independent claim 1 is not unpatentable over the Root patent in view of the Foxlin patent.

Moreover, as the Examiner acknowledged at the bottom of page 4 carrying over to the top of page 5 of the Office Action, the Root patent does not disclose the use of a Kalman filter. Therefore, the Examiner argues that the Kalman filter described in the Foxlin patent could be used in place of the smart algorithm described in column 7, lines 52-56 of the Root patent.

However, even if it would have been obvious to use a Kalman filter in place of the smart algorithm described in column 7, lines 52-56 of the Root patent, there is no disclosure in either the Root patent or the Foxlin patent to suggest that such a Kalman filter would receive data from a motion classification unit.

Indeed, as discussed above, there is no disclosure in the Root patent that the smart algorithm described in column 7, lines 52-56 of the Root patent receives data from the CPU. Also, there is no disclosure in the Foxlin patent that the Kalman filter receives data from a motion classification unit.

Accordingly, because neither the Root patent nor the Foxlin patent discloses or suggests "a motion classification unit connected to receive data from said sensors," and "a Kalman filter connected to receive data from said motion classification unit and from said sensors, said Kalman filter having an output connected to said motion classification unit and said energy estimator unit so that said energy estimator unit is operable to identify an energy expenditure by the human," independent claim 1 is not unpatentable over the Root patent in view of the Foxlin patent.

It is noted that, at the bottom of page 5 and carrying over to the top of page 6 of the Office Action, the Examiner asserts that the terms "connected to," "so that," and "operable" are terms of use and not limitation. However, these terms characterize the nature of other terms in the claim and, therefore, are a proper limitation. Thus, as claim 1 includes this language, it is proper to consider the language following the terms "connected to," "so that," and "operable" in determining the patentability of claim 1.

b. Claims 2, 3, and 7

Independent Claim 2 recites "sensors for sensing a human, an energy estimator unit and a health monitor unit connected to receive data from said sensors and Kalman filter connected to receive data from said sensors and having an output connected

to said energy estimator unit and said health monitor unit so that said energy estimator outputs an estimate of energy expended by the human and so that said health monitor outputs an indication of health of the human."

As noted above, the Root patent does not disclose a Kalman filter. The Foxlin patent does disclose a Kalman filter but only for compensating for the drift of inertial sensors. The Foxlin patent does not disclose or suggest using a Kalman filter for providing inputs to an energy estimator unit and a health monitor unit.

Moreover, because the device 101 as disclosed in the Root patent does not rely on gyroscopes or other inertial sensors, it cannot be reasonably argued the Foxlin patent suggests any use of a Kalman filter for the device 101 disclosed in the Root patent.

Accordingly, because neither the Root patent nor the Foxlin patent discloses or suggests "sensors for sensing a human, an energy estimator unit and a health monitor unit connected to receive data from said sensors and Kalman filter connected to receive data from said sensors and having an output connected to said energy estimator unit and said health monitor unit so that said energy estimator outputs an estimate of energy expended by the human and so that said health monitor outputs an indication of health of the human," independent claim 2 is not unpatentable over the Root patent in view of the Foxlin patent.

Because independent claim 2 is patentable over the Root patent in view of the Foxlin patent, dependent claims 3 and 7 are likewise patentable over the Root patent in view of the Foxlin patent.

It is noted that, at the bottom of page 5 and carrying over to the top of page 6 of the Office Action, the Examiner asserts that the terms "connected to," and "so that," are terms of use and not limitation. However, these terms characterize the nature of other terms in the claim and, therefore, are a proper limitation. Thus, as claim 2 includes this language, it is proper to consider the language following the terms "connected to," and "so that," in determining the patentability of claim 2.

C. Rejection of claims 8, 10, 11, 12, 13, and 14 under 35 U.S.C. §103(a)

i. Analysis

a. Claim 8

As discussed above, neither the Root patent, nor the Foxlin patent discloses or suggests "a motion classification unit connected to receive data from said motion sensors and generate therefrom a motion type indicator signal." Moreover, the Examiner has not established that the Vock patent discloses or suggests "a motion classification unit connected to receive data from said motion sensors and generate therefrom a motion type indicator signal."

Accordingly, the Examiner has not made out a prima facie case that independent claim 4 is obvious over the Root patent, the Foxlin patent, and the Vock patent.

Therefore, because the Root patent in view of the Foxlin patent and further in view of the Vock patent do not disclose or suggest "a motion classification unit

connected to receive data from said motion sensors and generate therefrom a motion type indicator signal" the Root patent in view of the Foxlin patent and further in view of the Vock patent do not anticipate independent claim 4.

Because independent claim 4 is patentable over the Root patent in view of the Foxlin patent and further in view of the Vock patent, dependent claim 8 is likewise patentable over the Root patent in view of the Foxlin patent and further in view of the Vock patent.

It is noted that, at the bottom of page 5 and carrying over to the top of page 6 of the Office Action, the Examiner asserts that the term "connected to," is a term of use and not limitation. However, this term characterizes the nature of other terms in the claim and, therefore, is a proper limitation. Thus, as claim 4 includes this language it is proper to consider the language following the term "connected to" in determining the patentability of claim 4.

b. Claims 10, 12 and 13

Independent claim 10 recites "a human motion classification and measurement system comprising...inertial sensors adapted for mounting to the human, an altimeter adapted for mounting to the human, a magnetic sensor,...a motion classification unit having inputs connected to said inertial sensors and said altimeter and said magnetic sensors, said motion classification unit having outputs for data identifying motion type of the human and distance traveled by the human."

As should be clear from above discussion, neither the Root patent nor the Foxlin patent discloses or suggests motion classification based on data from sensors. Moreover, the Examiner has not established that the Vock patent discloses or suggests motion classification based on data from sensors.

Therefore, because the Root patent, the Foxlin patent, and the Vock patent do not disclose, "a human motion classification and measurement system comprising...inertial sensors adapted for mounting to the human, an altimeter adapted for mounting to the human, a magnetic sensor,...a motion classification unit having inputs connected to said inertial sensors and said altimeter and said magnetic sensors, said motion classification unit having outputs for data identifying motion type of the human and distance traveled by the human," the Examiner has not made out a prima facie case that independent claim 10 is obvious over the Root patent, the Foxlin patent, and the Vock patent.

For this reason, independent claim 10 is patentable over the Root patent in view of the Foxlin patent and further in view of the Vock patent.

Because independent claim 10 is patentable over the Root patent in view of the Foxlin patent and further in view of the Vock patent, dependent claims 12, and 13 are likewise patentable over the Root patent in view of the Foxlin patent and further in view of the Vock patent.

It is noted that, at the bottom of page 5 and carrying over to the top of page 6 of the Office Action, the Examiner asserts that the term "connected to," is a term of use and not limitation. However, this term characterizes the nature of other terms in

the claim and, therefore, is a proper limitation. Thus, as claim 10 includes this language it is proper to consider the language following the term "connected to" in determining the patentability of claim 10.

c. Claim 11

Dependent claim 11 recites "a human model provided as input to said measurement prefilter." The Root patent, the Foxlin patent, and the Vock patent do not either alone or in combination disclose inputting a human model into their respective systems.

The Examiner argues that input of a human model is inherently disclosed in the Root patent, the Foxlin patent, and the Vock patent. However, the Examiner points to no disclosure in any of these patents from which the Examiner can reasonably conclude that input of a human model is inherently disclosed in the Root patent, the Foxlin patent, and the Vock patent.

Therefore, because the Root patent in view of the Foxlin patent and further in view of the Vock patent do not disclose or suggest "a human model provided as input to said measurement prefilter," the Examiner has not established a prima facie case of inherency with respect to dependent claim 11. For this reason and for the reasons described above with respect to claim 10, dependent claim 11 is patentable over the Root patent in view of the Foxlin patent and further in view of the Vock patent.

d. Claim 14

Independent claim 14 recites "a motion classification unit having inputs connected to said inertial sensors and said altimeter and said magnetic sensors, said motion classification unit having outputs for data identifying motion type of the human and distance traveled by the human."

As discussed above, neither the Root patent nor the Foxlin patent discloses or suggests motion classification based on data from sensors. Moreover, the Examiner has not established that the Vock patent discloses or suggests "a motion classification unit having inputs connected to said inertial sensors and said altimeter and said magnetic sensors, said motion classification unit having outputs for data identifying motion type of the human and distance traveled by the human."

Accordingly, the Examiner has not made out a prima facie case that independent claim 14 is obvious over the Root patent, the Foxlin patent, and the Vock patent.

Therefore, because Root patent in view of the Foxlin patent and further in view of the Vock patent do not teach or suggest "a motion classification unit having inputs connected to said inertial sensors and said altimeter and said magnetic sensors, said motion classification unit having outputs for data identifying motion type of the human and distance traveled by the human," independent claim 14 is patentable over the Root patent in view of the Foxlin patent and further in view of the Vock patent.

It is noted that, at the bottom of page 5 and carrying over to the top of page 6 of the Office Action, the Examiner asserts that the term "connected to," is a term of use and not limitation. However, this term characterizes the nature of other terms in the claim and, therefore, is a proper limitation. Thus, as claim 14 includes this language it is proper to consider the language following the term "connected to" in determining the patentability of claim 14.

D. Rejection of claims 18 and 19 under 35 U.S.C. §103(a)

i. Analysis

a. Claim 18

Dependent claim 18 (in combination with independent claim 4) is recites "a human motion classification and measurement system a personal status sensor adapted for mounting on a human, motion sensors adapted for mounting on a human, a motion classification unit connected to receive data from said motion sensors and generate therefrom a motion type indicator signal and an output unit connected to said personal status sensors and to receive said motion type indicator signal, said output unit providing an output indicating a status of human activity of the human wherein said personal status sensor includes a respiration sensor."

As discussed above, the Root patent does not disclose or suggest motion classification based on data from sensors. Moreover, the Examiner has not established that the Teller patent discloses or suggests motion classification based on data from sensors.

Accordingly, because neither the Root patent nor the Teller patent suggests "a human motion classification and measurement system a personal status

sensor adapted for mounting on a human, motion sensors adapted for mounting on a human, a motion classification unit connected to receive data from said motion sensors and generate therefrom a motion type indicator signal and an output unit connected to said personal status sensors and to receive said motion type indicator signal, said output unit providing an output indicating a status of human activity of the human wherein said personal status sensor includes a respiration sensor," claim 18 is not unpatentable over the Root patent in view of the Teller patent. The Examiner has not made out a prima facie case that dependent claim 19 is obvious over the Root patent and the Teller patent.

For this reason, dependent claim 18 is patentable over the Root patent in view of the Teller patent.

b. Claim 19

Dependent claim 19 (in combination with independent claim 4) recites "a human motion classification and measurement system a personal status sensor adapted for mounting on a human, motion sensors adapted for mounting on a human, a motion classification unit connected to receive data from said motion sensors and generate therefrom a motion type indicator signal and an output unit connected to said personal status sensors and to receive said motion type indicator signal, said output unit providing an output indicating a status of human activity of the human wherein said personal status sensor includes a hydration sensor."

As discussed above, the Root patent does not disclose or suggest motion classification based on data from sensors. Moreover, the Examiner has not established

that the Teller patent discloses or suggests motion classification based on data from sensors.

Accordingly, because neither the Root patent nor the Teller patent suggests "a human motion classification and measurement system a personal status sensor adapted for mounting on a human, motion sensors adapted for mounting on a human, a motion classification unit connected to receive data from said motion sensors and generate therefrom a motion type indicator signal and an output unit connected to said personal status sensors and to receive said motion type indicator signal, said output unit providing an output indicating a status of human activity of the human wherein said personal status sensor includes a hydration sensor," claim 19 is not unpatentable over the Root patent in view of the Teller patent. The Examiner has not made out a prima facie case that dependent claim 19 is obvious over the Root patent and the Teller patent.

For this reason, dependent claim 19 is patentable over the Root patent in view of Teller.

Respectfully submitted,

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CLAIMS APPENDIX

1. A human motion classification and measurement system, comprising:

sensors for sensing a human;

a motion classification unit connected to receive data from said sensors;

an energy estimator unit connected to receive data from at least one of said motion classification unit and said sensors; and

a Kalman filter connected to receive data from said motion classification unit and from said sensors, said Kalman filter having an output connected to said motion classification unit and said energy estimator unit so that said energy estimator unit is operable to identify an energy expenditure by the human.

2. A human motion classification and measurement system, comprising:

sensors for sensing a human;

an energy estimator unit and a health monitor unit connected to receive data from said sensors; and

a Kalman filter connected to receive data from said sensors and having an output connected to said energy estimator unit and said health monitor unit so that said energy estimator outputs an estimate of energy expended by the human and so that said health monitor outputs an indication of health of the human.

3. A human motion classification and measurement system as claimed in claim 2, further comprising:

an alarm connected to an output of said health monitor unit to indicate traversal of a threshold.

4. A human motion classification and measurement system, comprising:

a personal status sensor adapted for mounting on a human;

motion sensors adapted for mounting on a human;

a motion classification unit connected to receive data from said motion sensors and generate therefrom a motion type indicator signal; and

an output unit connected to said personal status sensors and to receive said motion type indicator signal, said output unit providing an output indicating a status of human activity of the human.

5. A human motion classification and measurement system as claimed in claim 4, wherein said output unit includes an energy estimator unit operable to provide an estimate of energy expended by the human and a health monitor unit operable to activate an alarm upon traversal of a health threshold.

6. A human motion classification and measurement system as claimed in claim 4, wherein said personal status sensor includes at least one of a heart rate sensor and a respiration sensor and a hydration sensor.

7. A human motion classification and measurement system as claimed in claim 4, wherein said motion sensors are inertial sensors including gyroscopic sensors and accelerometers.

8. A human motion classification and measurement system as claimed in claim 4, further comprising:

an altimeter for mounting on the human and having an output connected to said motion classification unit; and

a magnetic sensor for mounting on the human and having an output connected to said motion classification unit.

9. A human motion classification and measurement system as claimed in claim 4, further comprising:

a filter connected to receive data from said motion classification unit, said filter having an output connected to said motion classification unit and to said output unit.

10. A human motion classification and measurement system, comprising:

personal status sensors adapted for mounting to a human;

inertial sensors adapted for mounting to the human;

an altimeter adapted for mounting to the human;

a magnetic sensor adapted for mounting to the human;

a global positioning satellite sensor for mounting to a human;

a motion classification unit having inputs connected to said inertial sensors and said altimeter and said magnetic sensors, said motion classification unit having outputs for data identifying motion type of the human and distance traveled by the human;

an energy estimator and health monitor unit having inputs connected to said personal status sensors and said output of said motion classification unit for motion type data to output energy expenditure information on the human motion and to trigger an alarm upon traversal of a health threshold;

an inertial navigation unit connected to receive data from said inertial sensors and having a navigation state output;

an input preprocessing unit having inputs connected to said global positioning satellite sensor and said magnetic sensor and said altimeter and said motion classification unit and having an output; and

a filter connected to receive data from said output of said input preprocessing unit, said filter having an output connected to said motion classification unit and said energy estimator and health monitor units and said inertial navigation unit.

11. A human motion classification and measurement system as claimed in claim 10, further comprising:

a measurement prefilter connected between said input preprocessing unit and said filter; and

a human model provided as an input to said measurement prefilter.

12. A human motion classification and measurement system as claimed in claim 10, further comprising:

an initial input to said input preprocessing unit.

13. A human motion classification and measurement system as claimed in claim 10, further comprising:

a human input to said input preprocessing unit.

14. A human motion classification and measurement system, comprising:

personal status sensors adapted for mounting to a human including a respiration sensor and a heart rate sensor and a hydration sensor;

inertial sensors adapted for mounting to the human including three axis gyros and three axis accelerometers;

an altimeter adapted for mounting to the human;

a magnetic sensor adapted for mounting to the human;

a differential global positioning satellite sensor adapted for mounting to a human;

a motion classification unit having inputs connected to said inertial sensors and said altimeter and said magnetic sensors, said motion classification unit having

outputs for data identifying motion type of the human and distance traveled by the human;

an energy estimator and health monitor unit having inputs connected to said personal status sensors and said output of said motion classification unit for motion type data to output energy expenditure information on the human motion and to trigger an alarm upon traversal of a health threshold;

an inertial navigation unit connected to receive data from said inertial sensors and having a navigation state output;

an input preprocessing unit having inputs connected to said global positioning satellite sensor and said magnetic sensor and said altimeter and said motion classification unit and having an output;

a filter connected to receive data from said output of said input preprocessing unit, said filter having an output connected to said motion classification unit and said energy estimator and health monitor units and said inertial navigation unit;

a measurement prefilter connected between said input preprocessing unit and said filter;

a human model provided as input to said measurement prefilter;

an initial input to said input preprocessing unit; and

a human input to said input preprocessing unit.

15. A method for monitoring human motion, comprising the steps of:

sensing motion and metabolism rate of a human;

classifying the motion of the human sensed in said sensing step; and

estimating energy expended by the human from the classified motion and from the metabolism rate.

16. A method as claimed in claim 15, further comprising the step of:

triggering an alarm if a health threshold is traversed.

17. A method as claimed in claim 15, further comprising the steps of:

providing landmarking position data for the human.

18. A human motion classification and measurement system as claimed in claim 4, wherein said personal status sensor includes a respiration sensor.

19. A human motion classification and measurement system as claimed in claim 4, wherein said personal status sensor includes a hydration sensor.

EVIDENCE APPENDIX

There is nothing to present in the Evidence Appendix.

RELATED PROCEEDINGS APPENDIX

There is nothing to present in the Related Proceedings Appendix.